COMPUTER TOOLS IN IDEATION PROCESS AMONG UNIVERSITI TEKNOLOGI MALAYSIA INDUSTRIAL DESIGN STUDENTS

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ABSTRACT

Design students usually sketch their ideas manually during the ideation process. In the process of generating newly formed ideas and cognitive activities, design students sketch out their initial ideas at feasibility stage. Computer tools were introduced to design students in assisting the ideation process as well, for example, *Adobe Photoshop* which has enable students to create their initial ideas. However, there are advantages and disadvantages of introducing computer tools to design students. This has triggered the need to study the identification of Adobe Photoshop's capability in assisting cognitive activities and generating ideas within the feasibility stage. This study identifies how computer tool influences design students in practicing feasibility study during ideation process. First year students of Universiti Teknologi Malaysia Industrial Design were selected to participate in two idea generation experiment sessions, which are the manual hand sketch and computer generated sketch by using *Adobe Photoshop*. Hand sketches and computer generated sketches produced in the sessions were collected and analyzed using *Torrance Cognitive Elements of Design Creativity* and *Visual Reasoning Model*. *Torrance Cognitive Elements of Design Creativity* method is chosen to evaluate the diversifying ideas by the students. The evaluation was based on fluency, flexibility and originality. However, the study showed that *Adobe Photoshop* did not encourage convergence of ideas, which related to elaboration and problem sensitivity at feasibility stage. The same result obtained in the *Visual Reasoning Model* analysis also showed that *Adobe Photoshop* did not encourage iterative movements of transformation and generation component in the convergence of ideas. On the other hand, the research findings also indicated that 2D software like *Adobe Photoshop* has encouraged students to diversify their ideas. Other computer tools might be needed to perform a comprehensive convergence of ideas in feasibility stage.

ABSTRAK

Pelajar rekabentuk melakar idea secara manual dalam proses menjana idea. Proses melakar di peringkat *feasibility* dilakukan bagi membolehkan aktiviti kognitif dan proses penjanaan idea baru berlaku. Perisian computer seperti *Adobe Photoshop* telah diperkenalkan digunakan oleh pelajar untuk membantu proses penghasilan idea awal ketika proses penjanaan idea. Walau bagaimanapun, terdapat kebaikan dan keburukan memperkenalkan alat komputer kepada pelajar rekabentuk. Perkara ini mencetuskan keperluan untuk mengkaji keupayaan *Adobe Photoshop* dalam membantu aktiviti kognitif dan menjana idea dalam peringkat *feasibility*. Kajian ini mengenal pasti bagaimana alat komputer mempengaruhi pelajar rekabentuk dalam mengamalkan kajian *feasibility* dalam proses penjanaan idea. Pelajar Rekabentuk Industri tahun pertama Universiti Teknologi Malaysia telah dipilih untuk mengambil bahagian dalam dua sesi eksperimen penjanaan idea, iaitu lakaran secara manual dan lakaran janaan komputer dengan menggunakan *Adobe Photoshop*. Lakaran yang dihasilkan dalam kedua-dua sesi telah dikumpul dan dianalisis menggunakan *Torrance Cognitive Elements Of Design Creativity* dan *Visual Reasoning Model*. Kaedah *Torrance Cognitive Elements of Design Creativity* digunakan untuk menilai kepelbagaian idea yang dihasilkan oleh pelajar. Penilaian ini adalah berdasarkan faktor kefasihan, fleksibiliti dan keaslian idea. Walau bagaimanapun, kajian menunjukkan bahawa *Adobe Photoshop* tidak menggalakkan pembangunan idea-idea yang berkaitan dengan penghuraian masalah dan sensitiviti. Keputusan yang diperolehi dalam analisis *Visual Reasoning Model* juga menunjukkan bahawa *Adobe Photoshop* tidak menggalakkan lelaran pergerakan komponen transformasi dan penjanaan dalam pembangunan idea. Sebaliknya, kajian menunjukkan bahawa perisian 2D seperti *Adobe Photoshop* menggalakkan pelajar untuk mempelbagaikan idea mereka. Alat komputer yang lain mungkin diperlukan untuk pembangunan idea yang komprehensif di peringkat *feasibility*.

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CHAPTER 1

INTRODUCTION

1.1 Research Overview

Industrial design programme has been introduced to tertiary education in Malaysia universities since 1970. Through industrial design programme, students will acquire the knowledge for design process, design methods and design tools which are covered in the programme. The advancement of technology in this area has made the syllabus more comprehensive and be further revised for the students to meet the industries demands. New subjects such as computer aided design (CAD), computer graphics application, and computer engineering drawing are incorporated into the revised syllabus. This is needed to aid students in handling their design experience more effectively.

As technologies develop to a higher level, new technologies and devices are invented to improve human daily life. One of the common scenarios that can be seen is the use of computer tool such as *Microsoft Office* to perform office works. Similar scenario in academic institutions, where students utilised a number of computer tools such as *Photoshop*, *Illustrator*, *Rhinoceros* and *3D studio Max* in the designing process.

According to Shazali (1999), Information technology (computer tools) has made the process of new product development management more effective in handling product design process. Walther, Robertson et al. (2007) stated that computer tools shorten the time needed in designing, enhances communication and visualizations. However, computer tools also might restrict the designers' creativity because of the extra concentration to over-reach the computer requirements, rather than to opt for other alternatives. In different stages of designing process, different computer tools were created to ease the design process.

Different kinds of computer tool such as *Adobe Photoshop* is introduced to students in design courses, but how far has this computer tool helped design students in performing idea generation in design projects. This has triggered the motivation to study cognitive activities in designing process and the roles of computer tools in assisting cognitive activities in designing process.

1.2 Problem Statement

The use of computer tools in designing process has become a scenario in the industrial design education. Computer tools designed to assist the designing process but how far does these computer tools assist the design students? Two dimensional computer tool such as *Adobe Photoshop* able or not to assist design creativity and visual reasoning in feasibility stage during ideation process?

1.3 Hypothesis

Design students produce sketches manually by using papers, pen or pencil in feasibility stage. Computer tools have been widely introduced in design education, it

was hypothesised that computer tool such as *Adobe Photoshop* able to assist design students in generating ideas during feasibility stage. However, the computer tool unable to help design students in performing the cognitive activities (iterative process of analysis, synthesis and evaluation) during feasibility stage.

1.4 Objectives

The main objectives of this research are as below:

i. To ascertain an improvised method to evaluate visual reasoning and design creativity in ideation process.
ii. To evaluate design creativity and visual reasoning when design student generating ideas using manual drawing and computer tool during feasibility stage.
iii. To examine the computer tool (*Adobe Photoshop*) in assisting the design students in producing ideas in ideation process.
iv. To identify the advantage and disadvantage of using *Adobe Photoshop* in feasibility stage.

1.5 Project Aim

This study intends to identify how *Adobe Photoshop* assisting creativity and cognitive activities in feasibility stage. This study also serves as a guide to designers in choosing the appropriate computer tool based on the limitation of the computer tool to execute their designs. Besides that, this study also creates awareness to the design educator the importance of synthesizing visual information during ideation

process, rather than directing the design students' thinking by the capabilities of the computer tools.

1.6 Research Questions

The research questions for this study are as below:

i. What to evaluate in feasibility study stage?
ii. How to evaluate feasibility study stage?
iii. Which computer tool used by design students during feasibility study stage?
iv. How computer tool assist feasibility study stage among UTM Industrial Design students?

1.7 Research Methodology

A few research methodologies have been choose for this study to achieve the objectives of the study. The methodologies are as below:

i. **Literature review:** It is use to review the important of sketches used in studying design process. Literature review also has been done to understand the natures of feasibility stage in ideation process which consist of design creativity and visual reasoning. Methods used in other studies to measure design creativity and visual reasoning also identified in the literature review.

ii. **Experiment:** An experiment will be designed to collect data in the form of sketches from design students. Respondents are responding to two different experiment session which is generating ideas using manual drawing and also computer tool. The respondents will be picked base on convenience non-random sampling method. UTM first year Industrial Design students have been choosing as respondent for this study. Sketches produce by the respondents will be collected and analysed statistically.

1.8 Research Scope

Research scope has been set up in order to define the study area. The study area focuses on ideation process. (Winner, Pennell et al. 1988) mentioned that 70% of the project cost is affected by the decisions made in the first 30% of a project life. This explain that the creative decision made during the ideation process is very important as it will influence the high cost involved in prototyping, moulding and production at the later stage of design process.

Ideation is the key activity in any designing processes where designers seek ideas, explore possibilities and evaluate solutions for a problem. In ideation process, designers go through feasibility study, preliminary design and subsequently the detail design stage to get a solid design solution. This study will focus on the feasibility study stage which is the most important stage whereby designers will use their divergent thinking (creative mind) to generate alternative and isolated concepts.

Designers record their ideas and possible solutions via sketches which function as a medium to externalise and analyse thoughts and simplify multi-faceted problems to make them more understandable (Pipes 2007). The sketches produced during the feasibility study stage reflect the visual reasoning emerged in the search of

possible solutions. This directed the study to focus on sketches produced using both manual drawing and computer tool during the feasibility study stage.

The subject of this study is a group of first year industrial design students from University Technology Malaysia (UTM). These students are the first batch of design students going through the *Adobe Photoshop* course. The subject is chosen based on their ability in using *Adobe Photoshop* to generate ideas. The study lays interest on identify and evaluate cognitive activities, as to investigate how computer tools might help in the designing process.

1.9 Limitation of Study

There are a few limitations in this study. The experiment only conducts on UTM Industrial Design first year students. This is due to they are the only group of student undertaking *Adobe Photoshop* class and practicing designing.

In the experiment, students were asked to produce design in an examination setting. The setting might give certain level of pressure to respondent during the experiment sessions. This is to make sure that only sketches produce in the feasibility study stage will be collected for the study purposes. Besides that, situation such as students not passing up all sketches can be avoided.

In the sketches analysis, actions in the sketching process was first identified, and then matched with the coding scheme proposed in the *Visual Reasoning Model*. The analysis was done based on individual interpretation and perspective of view due to no expertise in using Torrance Creativity Test and *Visual Reasoning Model* in Malaysia. The limitation can be overcome by make sure the interpretation and perspective of view on the coding scheme are well discussed and understood before the analysis phase.

1.10 Significance of Study

The significance of the study is to suggest a method to evaluate visual reasoning and design creativity for feasibility study stage. Besides that, this study also helps in review the efficiency of using computer tool in ideation process among UTM Industrial Design students. The study also contributes to improve the effectiveness of ideation process in higher education environments.

1.11 Research Framework

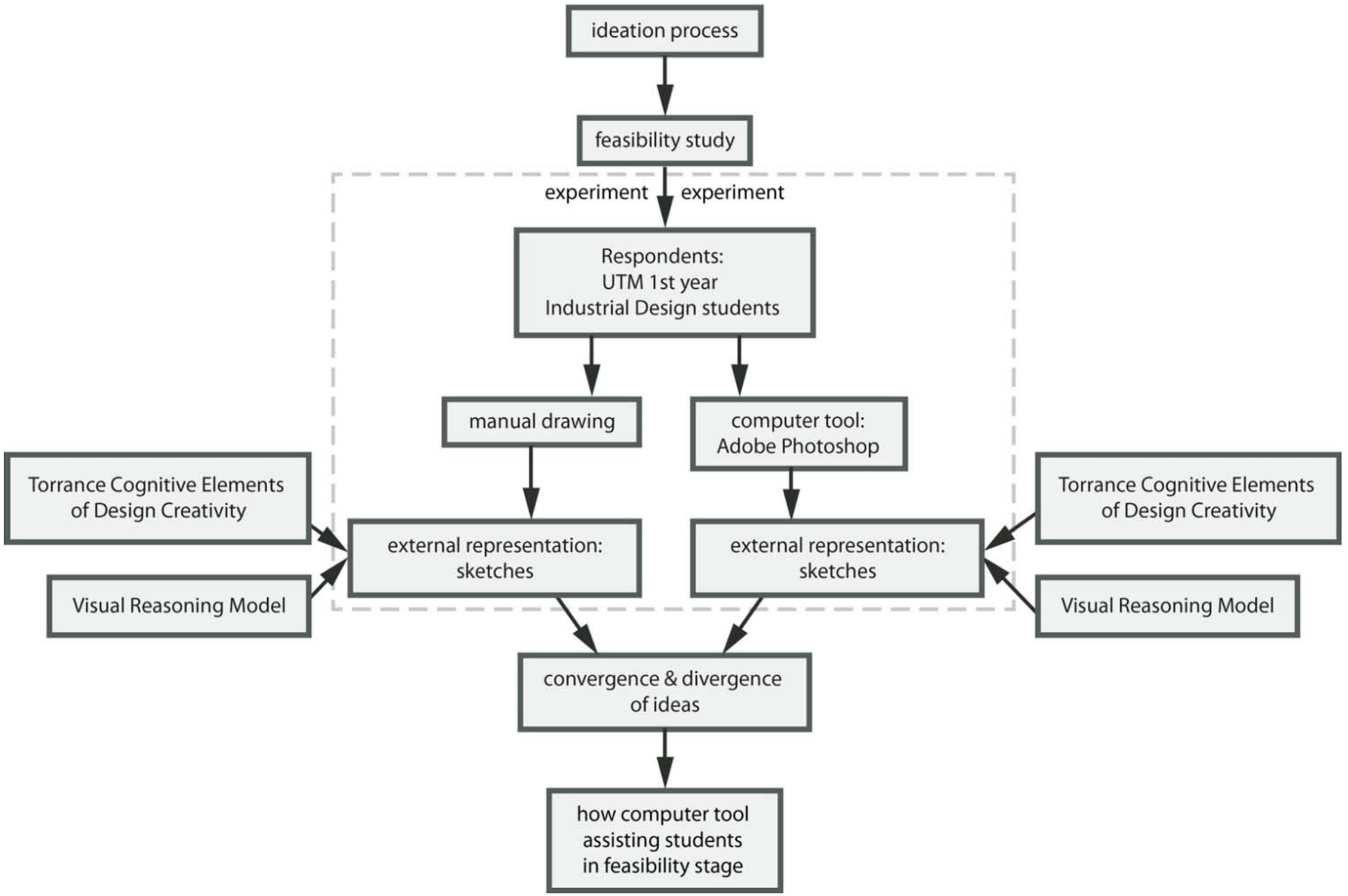

Figure 1.1 Research Framework

1.12 Research Schedule

Table 1.1 Research Schedule

Research Process	2010		2011		2012	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6
Problem Statement						
Establish Hypothesis						
Definition of Key-words						
Review of Related Literature						
Draft Research Proposal						
Defent Research Proposal						
Establish Research Framework						
State Methodology / Instruments Used						
Conduct of Experiment						
Data Analysis						
Report of The Finding						
Thesis Draft						

1.13 Summary

In this modern era, a wide range of computer tools are introduced to design students in universities and colleges in Malaysia. Computer tools in design institutions are seen as one of the crucial components to make the designing process more manageable and to ensure better work quality.

There are researches shown that computer tool shortened the time needed in designing, but at the same time might also restrict the designers' creativity. The effect of computer tools used in designing process has never been revealed objectively to allow better understanding on how computer tools are able to assist designers in designing process.

This study is performed to evaluate the effectiveness of computer tools in assisting design students during designing process, specifically designs students from UTM. The study area also limited to study the sketches produce by these students in feasibility stage.

Reviews on the design process, the creativity in design, the design creativity evaluation methods and the protocol analysis will be discussed further on the next chapter.

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